

Hengameh Bagherian, CV

Theoretical Particle Physics and Cosmology

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Education

Ph.D., Dep. of Physics, *Harvard University*, Cambridge, MA 2025
Advisor: Prof. Matthew Reece

M.A., Dep. of Physics, *Harvard University*, Cambridge, MA 2021

B.Sc., Dep. of Physics, *Massachusetts Institute of Technology*, Cambridge, MA 2019
Minor: Mathematics

Appointments

NSF Pstdoctoral Fellow, *University of Chicago*, Chicago IL Current
High Energy Particle Theory and Cosmology

Pstdoctoral Fellow, *Harvard University*, Cambridge MA Summer 2025
High Energy Particle Theory and Cosmology

Summer Researcher, *University of Regensburg*, Germany 2019
Lattice QCD

Summer Researcher, *Institute for Quantum Computing*, Canada 2017
Quantum Computing

Publications

- [1] Pouya Asadi, Hengameh Bagherian, Katherine Fraser, Samuel Homiller, Qianshu Lu “*Lepton Flavor Violation: From Muon Decays to Muon Colliders*,” *Under PRD Review* ([arXiv:2509.22771](https://arxiv.org/abs/2509.22771) [[hep-ph](#)])
- [2] Hengameh Bagherian, Majid Ekhterachian, Stefan Stelzl “*The Bearable Inhomogeneity of the Baryon Asymmetry*,” *Under JHEP Review* ([arXiv:2505.15904](https://arxiv.org/abs/2505.15904) [[hep-ph](#)])
- [3] Daniel Aloni, Hengameh Bagherian, Rashmish K. Mishra “*Evaporating Axion Dark Matter and the Hubble Parameter*,” *Under PRL Review* ([arXiv:2409.13807](https://arxiv.org/abs/2409.13807) [[hep-ph](#)])
- [4] Hengameh Bagherian, Melissa Joseph, Martin Schmaltz, Eashwar Sivarajan, “*Stepping into the Forest: Confronting Interacting Radiation Models for the Hubble Tension with Lyman- α Data*,” *Phys.Rev.D* **111** (2025) 4, 043513 ([arXiv:2405.17554](https://arxiv.org/abs/2405.17554) [[astro-ph.CO](#)])
- [5] Hengameh Bagherian, Katie Fraser, Samuel Homiller, John Stout, “*Zero Modes of Massive Fermions Delocalize from Axion Strings*,” *JHEP* **05** (2024) 079 ([arXiv:2310.01476](https://arxiv.org/abs/2310.01476) [[hep-th](#)])
- [6] Hengameh Bagherian, Matthew Reece, Linda Xu, “*The Inflated Chern-Simons Number in Spectator Chromo-Natural Inflation*,” *JHEP* **01** (2023) 099 ([arXiv:2207.11262](https://arxiv.org/abs/2207.11262) [[hep-th](#)])
- [7] Hengameh Bagherian, Scott Skirlo, Yicen Shen, Huaiyu Meng, Vladimir Ceperic, Marin Soljačić, “*On-Chip Optical Convolutional Neural Networks*,” [arXiv:1808.03303](https://arxiv.org/abs/1808.03303) [[cs.ET](#)]

Works in Progress

- [1] Hengameh Bagherian, Matthew Reece, Lian-Tao Wang, Huangyu Xiao, “*Birefringence Signal & the Quality Problem of ALP Dark Energy Solutions*”
- [2] Hengameh Bagherian, Azadeh Maleknejad, “*Gravitational Particle Production in deSitter: 1-Loop Corrections to Fermion Self Energy*”

Awards

Postdoctoral Research Fellowship Recipient, National Science Foundation (NSF) August 2025 - July 2028
Mathematical and Physical Sciences Ascending Postdoctoral Fellows (MPS-Ascend)

Honorable Mention, National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) April 2021

Neekeyfar Fund Award Recipient , Harvard University	Sep. 2019
Honorable Mention , National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP)	April 2019
Patent , " <i>Optical Ising Machines and Optical Convolutional Neural Networks</i> ," U.S. Patent No. 11,017,309	May 2021
Silver Medalist , Iranian National Physics Olympiad	Summer 2013 Tehran, Iran

Invited Talks & Seminars

Cosmological Aspect of Axion-Monopole Interactions

- The Great Lakes BSM Workshop

Dec. 02, 2025

The Unbearable Inhomogeneity of Baryogenesis

- Argonne National Laboratory – Seminar
- Perimeter Institute – Seminar
- University of Notre Dame – Seminar
- Brown University – IDEAS Seminar

Nov. 11, 2025

Oct. 28, 2025

Sep. 30, 2025

May 14, 2025

Interacting Dark Radiation and Cosmological Tensions

- Oxford University – Dalitz Seminar
- Kings College London – Seminar
- California Institute of Technology (Caltech) – Particle Physics Joint Seminar
- University of California, Irvine – Astrophysics Seminar
- University of Chicago – Particle Theory Seminar

Mar. 06, 2025

Mar. 12, 2025

Nov. 20, 2024

Nov. 19, 2024

Nov. 13, 2024

Constraining Interacting Dark Radiation with Lyman- α

- Northwestern University – Particle Theory Seminar
- Lawrence Berkeley National Laboratory (LBNL) – Particle Theory Seminar
- Stanford University – Particle Theory Seminar
- Boston University – Particle Theory Seminar

Oct. 18, 2024

April 10, 2024

April 05, 2024

April 03, 2024

"Zero Modes From Axion Strings And Massive Fermions"

- SLAC National Laboratory – Particle Theory Seminar
- CERN – Cosmo Coffee Hour
- University of Geneva – Particle Theory Group Seminar
- University of Geneva – Cosmology and Astrophysics Group Seminar

April 12, 2024

June 21, 2023

June 20, 2023

June 09, 2023

Other Talks & Posters

- PIKIMO (Phenomenology in Indiana, Kentucky, Illinois, Michigan, and Ohio)
Parallel Talk – "The Unbearable Inhomogeneity of Baryogenesis"
- KICP at University of Chicago
30 min Pizza Talk – "Constraining Interacting Dark Radiation with Lyman- α "
- Fermi National Laboratory (Fermilab) – Inaugural US Muon Collider Meeting
Poster – "Lepton Flavor Violation: From Muon Decays to Muon Colliders"
- Theoretical Advanced Study Institute (TASI) Summer School
Student Talk – "Constraining Interacting Dark Radiation with Lyman- α "
- LBNL – Fundamental Physics from Future Spectroscopic Surveys Workshop
Parallel Talk – "Constraining Interacting Dark Radiation with Lyman- α "
- Harvard University – Particle Theory Lunch Seminar
"Constraining Interacting Dark Radiation with Lyman- α "
- Harvard University – Particle Theory Lunch Seminar
"Zero Modes From Axion Strings And Massive Fermions"
- University of Pittsburgh – The 2023 Phenomenology Symposium (Pheno)

Nov. 08, 2025

Oct. 15, 2024

Aug. 7th, 2024

June 26, 2024

May 08, 2024

March 22, 2024

Nov. 09, 2023

May 09, 2023

Parallel Talk – “The Inflated Chern-Simons Number in Spectator Chromo-Natural Inflation”

- Massachusetts Institute of Technology – MIT 10 min Lightning Talks Feb. 05, 2023
“The Inflated Chern-Simons Number in Spectator Chromo-Natural Inflation”
- Cargese Summer School Aug. 05, 2022
Student Talk – “The Inflated Chern-Simons Number in Spectator Chromo-Natural Inflation”
- Harvard University – Particle Theory Lunch Seminar April 06, 2022
“The Inflated Chern-Simons Number in Spectator Chromo-Natural Inflation”

Teaching Experience

Graduate Teaching Fellow , Harvard University	Spring 2025
PHYSICS 232: Advanced Electromagnetism, <i>Prof. Sonia Paban</i>	
Graduate Teaching Fellow , Harvard University	Spring 2024
PHYSICS 254: The Standard Model, <i>Prof. Matthew Reece</i>	
Graduate Teaching Fellow , Harvard University	Spring 2023
PHYSICS 232: Advanced Electromagnetism, <i>Prof. Girma Hailu</i>	
Graduate Teaching Fellow , Harvard University	Fall 2021
PHYSICS 251A: Advanced Quantum Mechanics I, <i>Prof. Matthew Reece</i>	
Undergraduate Teaching Fellow , Harvard University	Fall 2020
Physical Sciences 2: Mechanics, Elasticity, Fluids, and Diffusion, <i>Dr. Greg Kestin & Dr. Louis Deslauriers</i>	

Workshops and Summer Schools

Inaugural US Muon Collider Meeting: Fermi National Laboratory	07 - 09 Aug. 2024 Batavia, IL
Theoretical Advanced Study Institute (TASI) Summer School: The Frontiers of Particle Theory	03 - 28 June 2024 Boulder, CO
Fundamental Physics from Future Spectroscopic Surveys Workshop: Lawrence Berkeley National Laboratory	06 - 08 May 2024 Berkeley, CA
Galileo Galilei Institute Winter School: GGI Lectures on the Theory of Fundamental Interactions	08 - 26 Jan 2024 Florence, Italy
Galileo Galilei Institute Workshop: Axions Across Boundaries Between Particle Physics, Astrophysics, Cosmology and Forefront Detection Technologies	26 April - 09 June 2023 Florence, Italy
Institut d’Etudes Scientifiques de Cargese Summer School: Rethinking Beyond the Standard Model	25 July - 6 Aug 2022 Corsica, France
ICTP Summer School: Summer School on Particle Physics	31 May - 11 June 2021 Trieste, Italy
Institute for Quantum Computing Summer School: The Undergraduate School on Experimental Quantum Information Processing	Summer 2017 Waterloo, Canada

Community and Outreach

Co-Chair – Women and Gender Minorities in Physics (GWIP) , Harvard University	2023 - Present
Organizer – HETG BSM Journal Club , Harvard University	Fall 2023
Organizer – Particle Theory Lunch Seminar , Harvard University	Fall 2022
President – Harvard Iranian Student Association , Harvard University	2021 - 2022
Volunteer Mentor – Polaris Mentoring Program , Harvard University	2019 - Present
Volunteer Mentor – Science Club For Girls (SCFG) , Cambridge, MA	2019 - 2020
SCFG is a nonprofit organization that addresses inequities in STEM around race, gender, and socioeconomics.	